

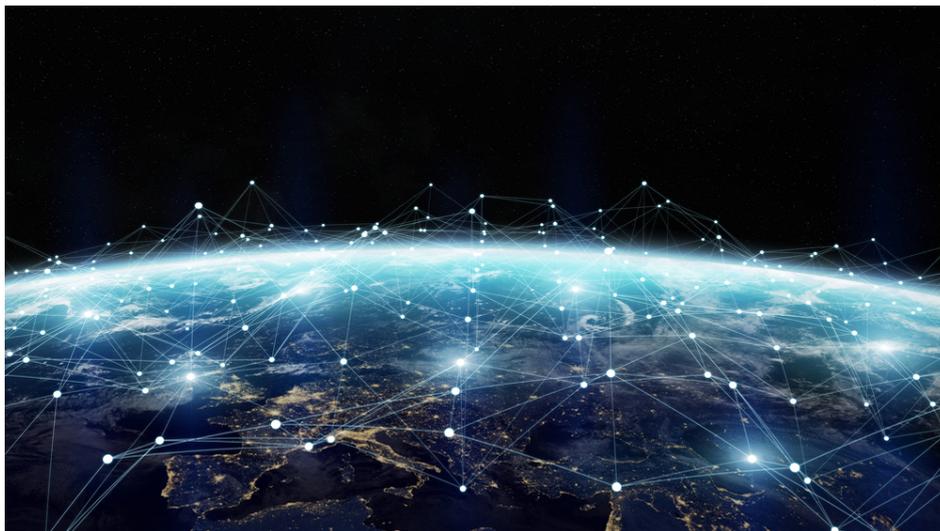
STUDY

Requested by the IMCO committee



New Developments in Digital Services

Short- (2021), medium- (2025)
and long-term (2030) perspectives
and the implications for the
Digital Services Act



Policy Department for Economic, Scientific and Quality of Life Policies
Directorate-General for Internal Policies
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and long-term (2030) perspectives
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Digital Services Act

Abstract

The study lays out predictions for digital services in the next one to ten years and provides recommendations for action for the European Parliament in preparation for the Digital Services Act.

This document was provided by the Policy Department for Economic, Scientific and Quality of Life Policies at the request of the committee on the Internal Market and Consumer Protection.

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LIST OF ABBREVIATIONS

ADHD	Attention Deficit Hyperactivity Disorder
AI	Artificial Intelligence
App	Application
B2B	Business-to-Business
CEM	Customer Experience Management
DNA	Deoxyribonucleic acid
DSA	Digital Services Act
ECB	European Central Bank
eGovernment	Electronic Government
e-tailing	Online retail(ing)
EU	European Union
FemTech	Female Technology
HR	Human Resources
ID	Identification
IIoT	Industrial Internet of Things
IT	Information Technology
LTE	Long Term Evolution
MEC	Mobile Edge Computer
MEP	Member of the European Parliament
QR-Code	Quick Response Code
UHD	Ultra High Definition
US	United States
UV	Ultraviolet
VR	Virtual Reality

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EXECUTIVE SUMMARY

Background

Digitisation is set to accelerate in the next 10-20 years. In addition to innovations in the consumer internet, we will see many developments in what is called the “industrial internet”, otherwise known as the “Industrial Internet of Things (IIoT)”. The B2B and enterprise sectors will be fully digitalised soon, and European companies will play a major part in this development. It is therefore important for EU lawmakers to make sophisticated and visionary decisions – to reassure people that not only companies in the US but the EU will benefit from this.

The underlying narrative of this report is that foreseeable developments in digital services require Europe to develop an appetite for digital leadership in the world.

This report is based on the assumption that inventions of digital services and technologies have a benign core and have been developed for a useful purpose. The report is targeted at the Members of the European Parliament (MEPs) and their teams, at the general public, interested entrepreneurs, and European decision makers in digital services.

The team of authors was asked by the Policy Department of the European Parliament to provide a visionary worldwide overview of new digital services and to derive a short action plan for the MEPs. The executive summary should be a maximum of 7500 characters without spaces, roughly 2-3 pages.

Aim

The authors of the report are committed Europeans with a broad knowledge of global trends and worldwide developments. The team of authors is driven by the will to inspire MEPs to be bold and visionary in their legislative and decision-making processes for the “Digital Services Act”.

The main aim of the report is to inspire – by providing a visionary outlook into the next 10 years – to help MEPs reach thoughtful, ground-breaking, and sophisticated decisions in the legislative process for the Digital Services Act.

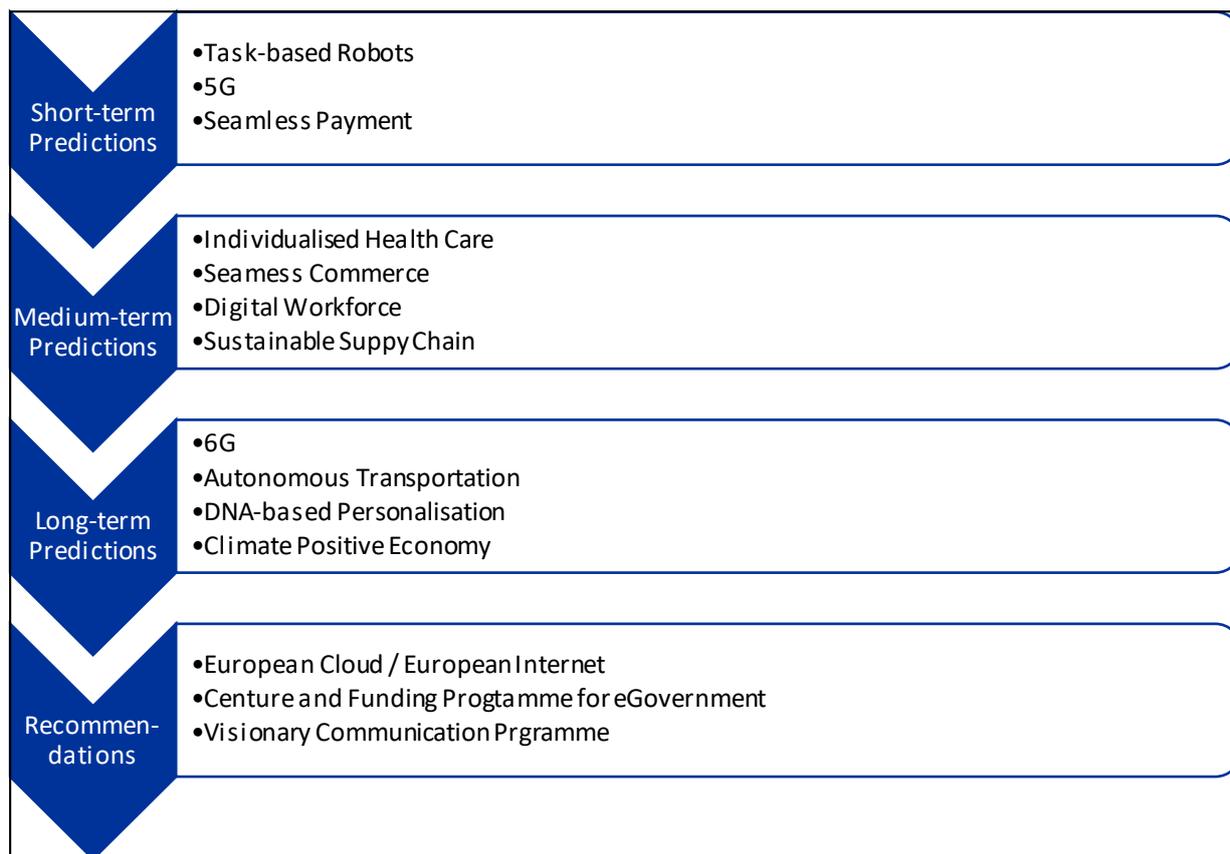
The report has four main chapters: The first chapter analyses developments arising in the next two years. Chapter two focuses on the next five years and chapter three looks ten years ahead. The aim of the research is to show how far digital services have already come, how seamlessly they work, and how smoothly they will be integrated into our everyday life.

In the final chapter, this report will provide a short action plan and recommendations that will help MEPs to create an ambitious plan in the legal framework. The three main elements of the action plan include:

- European Cloud / European Internet
- Venture and Funding Programme for eGovernment
- Visionary Communication Programme

Key Findings

Figure 1: The study at a glance



Source: Own illustration

The study on new developments in digital services analyses a total of eleven dedicated trends and developments, ranging from the next two years to the year 2030 (see Figure 1). In the short-term, task-based robots will take over most manual labour. Starting with agricultural robots, advancements in robotics will lead to more and more unskilled tasks being taken over by robots. Key technologies like 5G will allow for the “Industrial Internet of Things (IIoT)” to advance even further, making supply chains more efficient and enabling more autonomous transportation in the medium-term. Seamless payment enables a more fluent way of commerce for consumers, especially in regard to digital services.

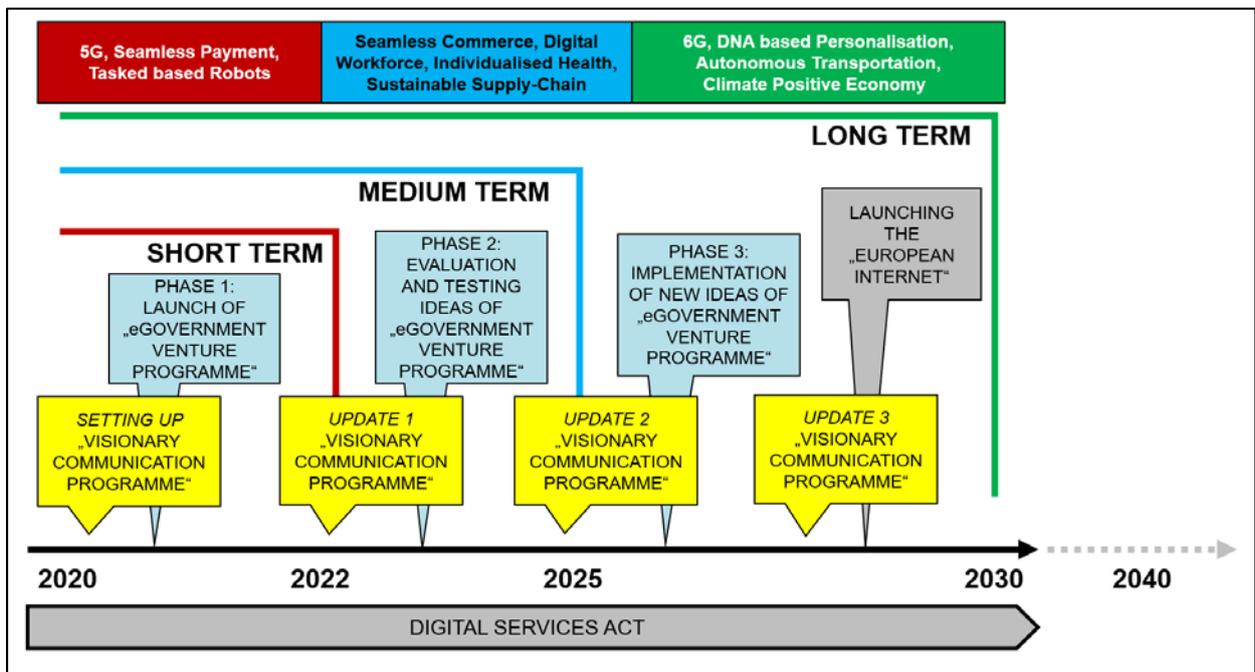
In the medium-term, a major trend is individualisation. Health care will rely more and more on data, enabling a proactive health care system that relies in prevention rather than treatment. Adding to seamless payment, seamless commerce will enable a fluent experience for customers, no matter the channel or location, merging online and offline shopping experiences. But not only consumers will change: Due to digital talents making up a large share of the workforce in the next five years, the relationship between employer and employee will change, making a digital culture imperative. A larger amount of companies will focus on ecology just as much as on economy, working hard to enable sustainable supply chains.

In the year 2030, the digitalisation of modern society, driven by innovative companies, may very well be completely possible (though not used by everybody). 6G mobile networks enable even more connectivity and autonomy in production and transportation. Autonomous cars will carry people; shipments will be transported completely without delivery drivers. Many products will be completely personalised, even relying on the use of DNA to find the perfect product for every customer.

To ensure the successful growth of society after the year 2030, it is important to consider the ecological implications. To ensure a sustainable global community, striving for a climate positive economy is key.

To make sure these predictions become reality and to prevent the misuse of digital tools, we advise the European Parliament to take a leading stance in the global digitalisation. Three main recommendations are given in the study: A European cloud / European internet could secure a reliable, trustworthy digital ecosystem in Europe. Funding programmes for eGovernment would use the innovative capabilities of start-ups throughout Europe to create the most digital and advanced government in the world. And all this should be communicated in a visionary and exciting way, making sure the right regulations are in place, but also encouraging boldness and showing a willingness to change (see Figure 2).

Figure 2: Action plan timeline



Source: Own illustration

1. INTRODUCTION

The 2020s and 2030s will be the two most dynamic decades in human history. The main reason for this will be the further digitisation of all sectors of the economy – especially what is called the “Industrial Internet of Things (IIoT)”.

At the time of writing this report in March and April 2020 it becomes visible that digital technology has become the backbone of all aspects of European society. The shutdown of many EU countries due to COVID-19 (Coronavirus SARS-CoV-2) demonstrates how important a sophisticated digital infrastructure is to keep economies running even at a basic level. During quarantine and under curfews, digital services enable working from home for many people. They also support private life, as digital services and e-commerce assists in providing the European population with food and supplies, entertainment, and the possibility to meet remotely. Governments and administrations in the EU can continue to govern and take decisions by digital teleworking and remote meetings. Without digital solutions the crisis would have had a worse impact.

As the Digital Services Act will be the legal framework in the EU for all digital developments over the next decade(s), it is paramount for MEPs to understand the upcoming new developments in digital services. In this report, we therefore offer a visionary outlook into the next ten years.

The authors will argue that the European Union needs to develop an appetite for digital leadership if it wants to compete with worldwide developments and to participate proactively rather than reactively.

In this report, we will show in three separate chapters what kind of developments are foreseeable. The first chapter will look at the next few years, while the second chapter will consider the situation five years into the future for the medium-term perspective. In the third chapter, we will feature trends that will manifest themselves in roughly ten years’ time.

The conceptual foundation for this report is benign and positive. We do not look too deeply into the risks and potentially dangerous scenarios, but rather attempt to understand the possible chances and opportunities.

Through all chapters of the reports, there are three underlying predominant trends that will impact all developments of digital services in the European Union.

Underlying trend 1: Seamlessness of digital services

In an increasingly digitised European Union, all upcoming digital services will blend seamlessly into the everyday world. Services will work anywhere, at any time, on any platform, and without friction. Seamlessness in this context means that all services will work by human interaction – by gesture, voice and facial recognition.

Underlying trend 2: Hyper-Individualisation

Digital services will be increasingly based on data about all individual users in the European Union. Products and services will be tailored for every individual user and consumer.

Underlying trend 3: Sustainability

Building on trend 1 and 2 sustainability is a megatrend that influences the life of every European in the next years. All European citizens want to embrace sustainable digital services. The report will show upcoming services that are sustainable, digital and personalised.

In the final chapter, we lay out an action plan for the European Union.

The basis of our arguments is rooted in a new approach of the European Commission manifested in the ambitious agenda that the President of the European Commission Ursula von der Leyen put out in mid-February 2020. The general idea in our action plan is that Europe should play a leadership role in all digital developments. How to do that? The authors of this report are convinced that three bold action plans are required:

Action Plan 1: European Cloud / European Internet

A European firewall/cloud/ internet would foster a digital ecosystem in Europe based on data and innovation. It would drive competition and set standards, similar to what has happened in China in the past 20 years. The foundations of such a European cloud are democratic values, transparency, competition and data protection.

Action Plan 2: Venture and Funding programme for eGovernment

The EU should set out a funding programme for European companies to build sophisticated eGovernment services. The aim of such a programme is to invest money in companies (start-ups and incumbents) that demonstrate a will to build deep digital services and infrastructure to enable a digital world of government. The EU Government and all the governments of the member states should lead by example and become the most modern digital government.

Action Plan 3: Visionary Communication Programme

This programme is based on the general idea that new fundamental technological advances will take place in the next few years. Quantum computing and a further distribution of AI will have an impact on all sectors of digital services. Hence a Visionary Communication Programme includes regular legislative updates of the Digital Services Act and it also involves a communication programme to educate and inspire European citizens about these developments.

2. SHORT-TERM PREDICTIONS

KEY FINDINGS

In the next two years, all aspects of modern life will at least be partly digital. Robots will take over most simple and manual tasks. Key technologies like 5G will allow more efficient manufacturing and autonomous transport solutions. Lastly, digital services will become one seamless experience, starting with e-commerce, as can be seen with WeChat and Alipay in China.

It is recommended to encourage a Europe-based solution for seamlessly integrating digital services as well as localising the digital infrastructure needed for operating the “Industrial Internet of Things (IIoT)”.

While regulation is important, it is imperative to not stand in the way of innovation within Europe’s borders. Instead of allowing foreign companies to implement their solutions in Europe, efforts must be made by Europe to create its own solutions that work just as well in order not to fall behind in international comparisons.

Short-term predictions are made for the immediate future, meaning the next two years. These predictions are not only tangible but can also be made with a high degree of certainty. Three trends in digital services can be highlighted.

Firstly, task-based robots will be able to take over manual labour and repetitive tasks even further. The investment needed for these robots will certainly be significantly reduced due to easier programming made possible by machine learning, as well as reduced manufacturing costs. The next significant step will be general use robots, able to perform a multitude of tasks.

5G networks are the next impactful innovation certain to be operational within the next few years. The new mobile network standard offers improved data transfer rates, low latency, connection capacity as well as the possibility of network slicing and mobile edge computing. Although 5G is not necessary for most consumer use cases, industrial applications will benefit from 5G networks – especially autonomous transport and connected manufacturing plants.

Lastly, seamless payment will enable a frictionless process in digital services within the next few years. Be it online or offline purchases, added services within existing solutions, as well as new players, will improve the user experience when purchasing any product or service in the future. Cash will lose its share of use even more in the future with digital payment systems taking over. In turn, digital state-run or private currencies will grow and become widely accepted.

2.1. Task-based robots

Robotics has already changed the economy significantly. Most manufacturing plants are run by robots that weld, assemble and transport everything from computers to cars. These robots are designed to fulfil one specific task and are what we call task-based robots. They are very costly to acquire and are very specialised. Newer robots may be fitted to perform a few different tasks, but this mostly involves costly re-programming, not to mention the production line standing still for a prolonged period. Nonetheless, robotic production is vastly more efficient than human-powered manufacturing. Recent improvements in these robots make them the central point of modern production.

With manufacturing robots reaching maturity and robot technology becoming increasingly sophisticated, other fields shift into focus.

One field being explored is agricultural task-based robots. Den Haag-based start-up Odd. Bot is currently working on the Weed Whacker (see Figure 3), an agricultural robot able to remove weeds from fields. The Weed Whacker is an autonomous system that identifies and plucks weeds from fields without damaging the crops or the ground. The business model is an on-demand robot-as-a-service model, meaning it is not bought but paid for as it is used. This means less risk for the farmers, as maintenance and defects are taken care of by the usage fee.

Figure 3: Weed Whacker by Odd.Bot



Source: <https://www.odd.bot/>

Another approach to solve this problem is the robot AVO by Swiss start-up ecoRobotix (see Figure 4). AVO uses advanced image recognition software to identify weeds in the field and spray herbicides precisely on weeds but not on the crops. According to ecoRobotix, this leads to a 95% decrease in herbicides needed. The robot navigates the fields autonomously and is solar powered using its own solar cells.

Figure 4: AVO by ecoRobotix



Source: <https://www.ecorobotix.com/en/>

Weeding, however, is not the only thing that agriculture robots are getting better at. Agrobot from Spain (see Figure 5) is working on strawberry harvesting robots. A task that, due to the fragile nature of strawberries, used to require large numbers of manual labourers for short periods of time during

harvesting. Now, due to an AI recognising ripe strawberries, the Agrobot can autonomously drive through farms picking ripe berries without damaging the fruits or the plants.

Figure 5: Agrobot



Source: <https://www.agrobot.com/>

These robots could potentially make industrial farming less labour intensive and more sustainable, as they are more efficient and do not rely on fossil fuels to operate. Additionally, the Weed Whacker, AVO and similar robots could soon drastically reduce the use of chemical herbicides, which are damaging to the soil and potentially harmful to humans.

After taking over manufacturing and agriculture, task-based robots may very well go on to conquer much of today's manual and unskilled labour. Be it construction sites, transportation and logistics, cleaning or maintenance, task-based robots will soon be an integral part of our digital economy.

2.2. 5G

Mobile broadband connections have gained incredible importance for digital services in the last few years. Business models like car-sharing would not have been possible without the use of a fast and reliable mobile internet. While the current 4G+ networks are sufficient for most consumer applications, more and more services will require fast access to the internet in the future, overloading our infrastructure.

5G is the solution to the growing number of devices – from personal consumer electronics and IoT devices to autonomous vehicles and robots, requiring a fast and reliable internet connection with low latency.

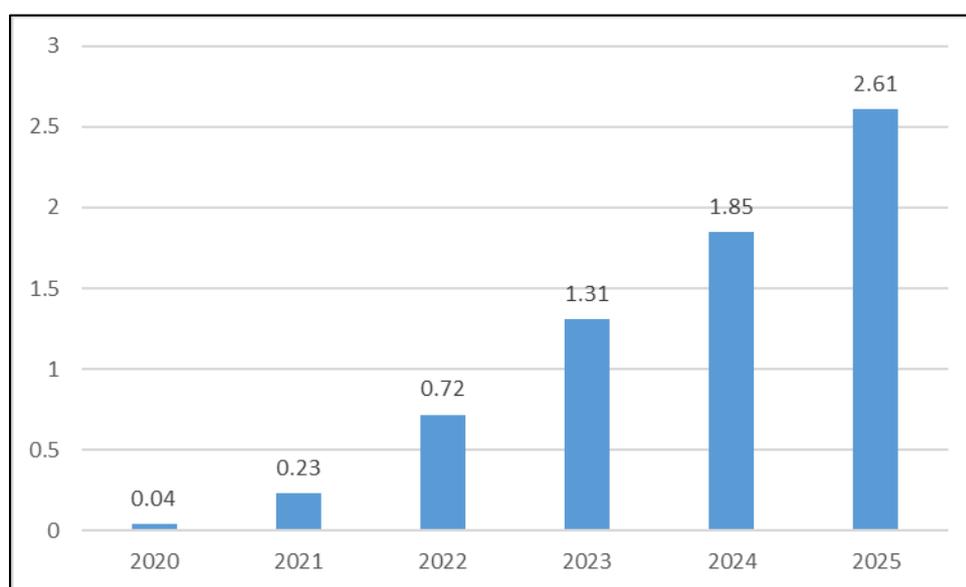
What is 5G?

5G is a new wireless standard that promises ultra-fast data transmission, low latency and high reliability. While the existing 4G+ network (LTE Advanced) generates data rates of up to 450 Mbit/s, 5G is expected to enable up to 10 Gbit/s. The latency will also be reduced from approx. 30 milliseconds to one millisecond. This is made possible by so-called Mobile Edge Computing (MEC). Here, the data centres for data processing are not located at a few central locations, but directly in the radio stations that access a cloud. Signals thus only have to bridge a short distance. And even though the signals travel at the speed of light, the physical distance still leads to latency so high that applications like autonomous cars cannot be safely operated with existing 4G networks.

Additionally, 5G radio stations may be equipped to connect to a large number of devices at the same time. These features make 5G an important technology for industrial uses, such as in smart factories or autonomous transportation (Steinhart, n.d.).

5G radio stations, however, have a much shorter range, meaning more stations are necessary to cover a given area. Combined with the fact that for most private users, the existing 4G network is perfectly adequate, consumer applications will mostly keep using the existing 4G network, with 5G being reserved for industrial uses. The 4G network speed is sufficient for the smooth streaming of videos and music, as well as mobile gaming and app use, and in the near future only mobile UHD streaming or demanding real-time online games will require 5G networks (Steinhart, n.d.).

Figure 6: Forecast: Number of 5G connections worldwide in billions



Source: <https://www.statista.com/statistics/858278/5g-subscriptions-forecast-worldwide/>

Where will 5G be used?

In principle, there will not be as many use cases for the new data standard in the private sector. The existing LTE network will be adequate for most purposes. This makes 5G all the more important for industry (Jejdling, 2018; Nokia 2019).

One of the most important areas of application for 5G is in autonomous vehicles. Low delays in vehicle-to-vehicle communication make cooperative, autonomous vehicle fleets possible. These are safer and more efficient than conventional vehicles (Jejdling, 2018; Nokia 2019).

Industrial automation and smart factories are another application area of 5G. Networked systems as well as the transmission and evaluation of large amounts of data ensure a significantly more efficient value chain (Jejdling, 2018; Nokia 2019).

In the world of work, 5G also makes mobile workplaces and networked work much easier. In the private sector, media use is particularly influenced by 5G. Improved transmission of live events and mobile entertainment, also in new forms such as virtual reality, are made possible by 5G (Jejdling, 2018; Nokia 2019).

Further applications, which cannot yet be foreseen today, will certainly follow.

2.3. Seamless Payment

While cash is still used for a significant amount of transactions, the share of cashless payment in Europe has been rising in the last few years. Each year sees about a 10% increase in cashless payment (ECB, 2019).

We predict an accelerated increase in the share of cashless payment in the coming years. When talking about cashless payment, (contactless) debit and credit cards are the first things that come to mind.

However, cashless payment also encompasses mobile payment solutions, such as Apple Pay, as well as services used for online purchases such as PayPal. Currently, all of these systems are more or less standalone solutions. With the advance of mobile payment, cash flow is becoming more fluid (Rauch, 2016).

An added benefit of the increase in electronic payments is the reduction of shadow economy. Each year trillions of Euro flow in the shadow market unregulated and untaxed, leading to long term deficits. Traceability of electronic payments is much better than with cash, leading to more information on the flow of money. This information can be used to reduce tax evasion and make regulation easier, in turn reducing the shadow economy (Muller et al., 2013, S. 10-12).

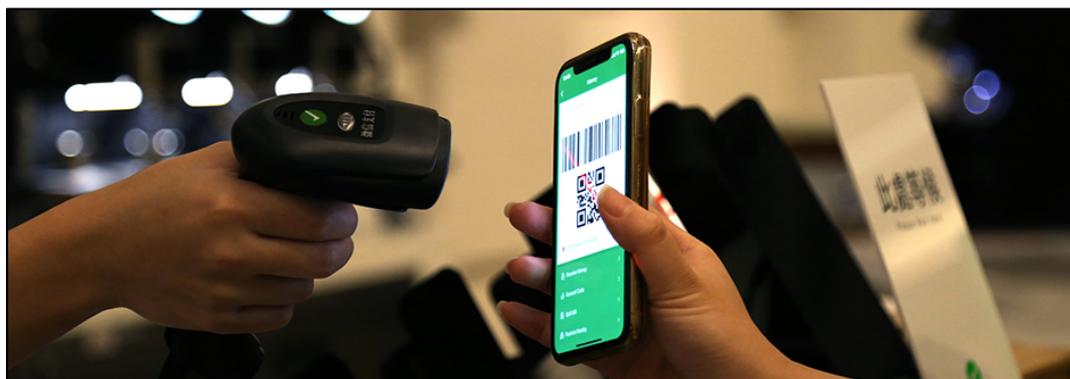
One step further comes the transformation from mobile payment solutions to seamless payment. Seamless payment is the elimination of borders in the process of purchasing items. Checkouts in particular will be made obsolete by new technologies that enable “Grab and Go” and other seamless systems (Feigl, 2019).

WeChat

Originally a messenger app and considered to be the Chinese WhatsApp, WeChat has come a long way since its inception in 2011. WeChat has become an integral part of the daily life of millions of people. Unlike WhatsApp, which is used almost exclusively for messaging (save for the occasional call or recently introduced status updates), WeChat offers so much more to its users. Over the past year, it has become an all-in-one solution for all kinds of services, including ride-hailing, food delivery, digital payment services, and an online e-commerce marketplace. WeChat basically offers its users a completely seamless experience of a multitude of digital services (Sapra, 2019).

WeChat lets users pay for their shopping at vending machines, public transport and the ever-present street vendors. Payment is made easy by using systems such as QR codes or mini-programmes (see Figure 7). Doctor’s appointments can be made through WeChat just as well as job applications. What’s more, WeChat’s operator Tencent Holdings Ltd. has no plans to stop just yet. According to a 2018 press release, WeChat plans to be part of the user’s daily life – from morning to night – with no gaps in between (Sapra, 2019). And they are on the right track to getting there with WeChat events starting to include a virtual ID in their app, used for social security by the Chinese government. In a nutshell, life in China is basically impossible without using WeChat (Sapra, 2019).

Figure 7: WeChat Quick Pay using QR codes



Source: https://pay.weixin.qq.com/index.php/public/wechatpay_en/product_intro?name=quick

What, however, constitutes the never before seen success of WeChat? We suggest an easy answer: a seamless and extremely convenient user experience. Instead of having to download a multitude of apps, registering each with an account and having to switch in between, WeChat offers an all-in-one solution. WeChat managed to eliminate the need for other apps by offering to close the gap in between. With WeChat, users are able to operate most of their lives with a single app, being able to use all kinds of digital services. This seamless and universally accepted solution is what sets WeChat apart from other apps.

Alipay

While WeChat is the undisputed number one when it comes to all-in-one solutions, there is another key player in the mobile payment market. Alipay, operated by Chinese retail giant Alibaba, has a market share of above 50% when it comes to mobile payments. Stemming from its ease of use while paying for purchases made on Alibaba's e-commerce platforms, Alipay has since expanded to become China's most used third-party payment app. It allows users to pay for digital purchases, transfer money, pay bills and pay for items in-store. Alipay can be used almost anywhere in China (Business Wire, 2019).

Similarly to WeChat, most purchases involving Alipay use QR codes. Recently, however, Alipay has introduced a new feature which greatly improves the seamlessness of its service: facial payment. Instead of scanning a QR code, a simple smile at the camera is all it takes to pay for a purchase. This makes payment even more convenient and turns it into an almost completely seamless experience. According to the operators, facial recognition is completely safe to use, as it is able to differentiate between real faces and pictures or videos. There has, however, been plenty of concern about data security and privacy (The Guardian, 2019).

2.4. Conclusion

In the short-term, digital services will continue to manifest themselves in all kinds of ways in our day-to-day lives. All services will become partly digital, paving the way for a seamless, digital future. First, the digitisation of specialised fields, such as task-based robotics and digital payment systems, will continue to permeate. Later, key technologies like 5G will allow for more general use and more autonomous digital solutions.

All in all, we predict a world that is partly digitised in all areas of life. Gaps in between services will close, creating a seamless digital world with many tasks being taken over by digital solutions, robots and the like.

That being said, considerations about regulating these digital services, while not inhibiting innovation and standing in the way of progress, is the most important task. If this fails, Europe will soon be taken over by companies from the US or China.

3. MEDIUM-TERM PREDICTIONS

KEY FINDINGS

The medium-term trends (up to the year 2025) are fostered by innovations throughout institutions, organisations, and businesses. Customers will experience seamless and hyper-individualised technologies that will enhance traditional systems and processes to match their digital affinity. Sustainability goals will inspire various technological advances and impact supply chain management globally.

According to this analysis, digitisation is estimated to be completed by the year 2025.

The midterm prediction for digital services extends to the year 2025. By then, many changes that are already happening in society will be implemented. Therefore, to predict feasible transformations, we need to look at current developments in the tech and e-commerce industries. But there is a multitude of prototypes and product concepts out there which need to be analysed and examined with regard to their disruptive potential. After analysing the market, we can conclude that four trends are dominating our economy.

Individualised health is an entirely different approach to health care. Instead of managing the diseases and illnesses of the population, focusing on the health and wellbeing of the individual will create a solid health care system. Thereby maximizing the health of the population contains the potential to reduce the cost of the medical system.

Seamless commerce will enable customers to experience an increase in convenience and excitement for the duration of a shopping trip, as well as before and after it. By creating a cohesive and consistent omnichannel strategy, companies will be able to improve the convenience factor for customers. Blurring the lines between online and offline shopping will enhance the customer experience. Commerce will take place wherever customers encounter a brand, whether it is online on social media, at an online shop, on the high street or while texting to a friend.

The so-called Digital Workforce will reform employer-employee relations. Supported by AI technology with a combination of digital platform solutions, employees will achieve an increased level of productivity. Companies will position themselves as a holistic hub for digital transformation that fosters a digital culture throughout the workplace and workforce. Traditional structures will make way for creativity and innovative thinking. The concept of New Work establishes agile processes and structures that capitalise on gainful employment.

A truly sustainable supply chain combines current technology with emerging trends to accomplish transparency, efficiency, and effectiveness. 3D printing is one of the many ways to create innovative production methods. The combination of this existing hardware will be enhanced by ever-changing software to include novel and sustainable materials – reducing design costs, time-to-market, and product wastage. Through the usage of filaments such as hemp, bamboo, or even recyclable plastics, digitally enabled production is moving towards more environmentally-friendly goals.

3.1. Individualised Health Care

Considering the midterm perspective, the health care system will change towards an individualised system. The focus of the medical system will change towards preventing health issues as quickly as possible by applying familiar and novel technologies. This approach to health care has several implications for institutions, organisations, businesses, and patients. Individualised health care will identify the individual as key to the success of a long-term health care approach: joint goals (esp. health and physical fitness) will encourage the development of individualised systems. The individual will be motivated to take action and cultivate a healthy lifestyle, which in turn will nurture the common goal.

Currently health care systems rely on a centralised model in which patients play a passive role. All kinds of health measurements and evaluations take place in health care institutions and hospitals. However, 80% of health outcomes are caused by aspects not related to the medical system. Eating and exercise habits, the socio-economic status, and an individual's residential area have a larger effect on health outcomes than medical care.

Enabled by technological change, individuals have started to actively manage their own health and well-being. Through the rise of app- and cloud-based software that empowers individuals to manage and visualise their health information, custom-made goals and plans feed performance more than common approaches. Creating a user-centred system furthers the self-management of one's health journey (Allen, 2019). Wearables, –devices worn like accessories that include (digital) value-adding functions – are particularly driving this trend in the health care system. In most cases, wearables take on the form of fitness trackers or smart watches. They provide users with easy access to health and fitness data. The user-friendly design of its interfaces tends to facilitate the urge to evaluate one's own data and increase one's performance metrics, thereby improving health and fitness (Kooiman, 2018). The motivation planted in the tracing and tracking of data is used to act upon a healthier, forward-thinking lifestyle. Research has confirmed that individuals who track their health data (most commonly through apps) are very likely to share this data with others. The high interconnection of devices through cloud-based systems and the standardisation of operating systems have triggered the data exchange trend. One of many surveys has found that 58% of respondents willingly share their health data with a health care professional (i.e. doctor) in order to gain greater accuracy in their diagnosis and more suitable treatment solutions (Marrouche, 2020).

As an example, the fitness tracker 'HealBe' measures health parameters such as calorie and water intake. This data is used to prompt suggestions helping to optimise your health (HealBe). The collection of data points is passive, meaning it does not require the manual transcription of data. This way, the measurement is more precise. This type of data registration is regular by nature, making it easier to spot trends and patterns.

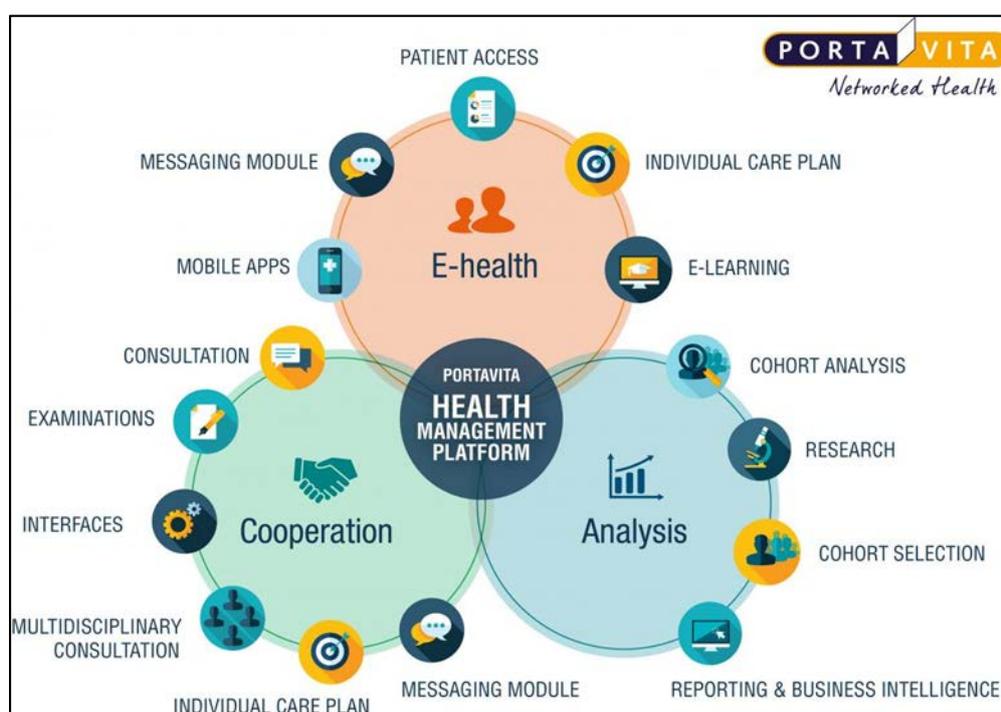
The variety of applications for health purposes – through HealBe or other wearables – is ever-growing. There is a new dynamic market supported by this phenomenon, called 'FemTech'. The diversity of gadgets and systems that support women in particular are increasing. The company 'Grace' has developed a smart bracelet (wearable) that serves to identify and predict the hot flushes that women experience during menopause. In order to prevent and treat those painful and annoying moments, the technology detects changes in body temperature (and other key characteristics) and translates this information to trigger a cooling process in the affected body area. The prevention of pain and other negative effects is measured over time and benefits from self-learning to increase the long-term efficiency (Grace, 2020).

Another way of helping patients with their health issues is through 'mHealth'.

According to a 2015 study, there were then 26,864 apps related to health care that were used on a frequent basis (Aitken et. al, 2015). At the same time, health apps represent the largest number of apps available (165,000). The assortment and diversity of health apps cater to more than just health (e.g. physical activity, nutrition) and lifestyle purposes (Aitken et. al, 2015). Another upcoming category is the apps that offer disease management capabilities. By offering assistance to the individual, these apps allow for a wide range of functions, including the implementation of treatment protocols through reminders. The individualisation found in the health care sector as a whole has influenced the concept of (hyper-) personalisation in regard to apps focusing on particular diseases and treatments. Up to a third of apps developed to target specific needs arising from certain diseases target mental health illnesses like autism, depression, and attention deficit hyperactivity disorder (ADHD) (Aitken et. al, 2015).

A network spanning from patient-generated data to multidisciplinary consultation is offered by various companies. One of them is 'Portavita', which offers a multi-dimensional health management platform to promote e-health (see Figure 8).

Figure 8: Example of health management platform



Source: <https://www.portavita.com/portavita-announces-health-management-platform>

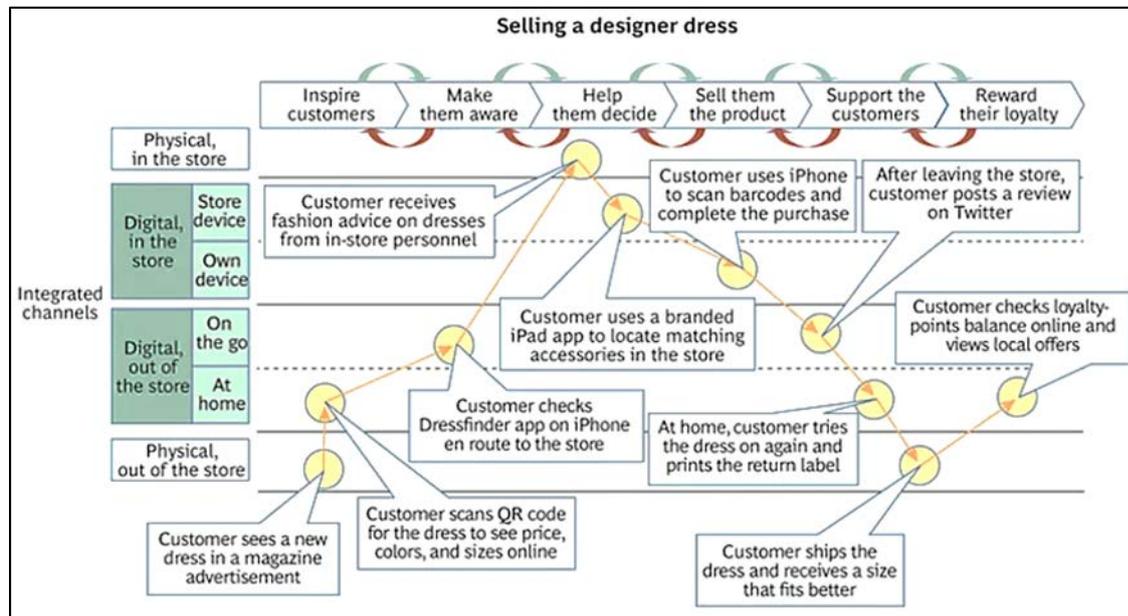
Key to the success of individualised health care strategies is the realisation of treating people as individuals when they become a patient. An integral element to this concept is regarding health care as a holistic service that promotes a satisfying patient experience – both online and offline, and everything in between.

3.2. Seamless Commerce

In five years, we will see a shift in the way we shop online and offline. The biggest difference will be the blurred lines between the two. With the emergence of seamless commerce, companies are trying to optimise the customer journey. The focus is on convenience at the interconnection of every brand touchpoint throughout the customer journey. E-commerce and offline distribution (i.e. through the point of sale) are growing closer together and merging into one seamless experience.

An improvement in matching expectations with experiences, paired with overcoming channel conflicts, creates a brand ecosystem that is coherent, consistent and authentic. By virtue of these omnichannel approaches, we can see the shopping experience moving away from a transaction-based system to an emotion-based ecosystem. Improvements and innovations cultivate developments from acquisitions to after-sale services and products. The Boston Consulting Group has conducted an in-depth analysis concerning the topic of omnichannelling, investigating the similarities and differences between online and offline channelling. An example of a nonlinear omnichannel purchasing journey is given to illustrate the effects of the changing purchasing patterns (see Figure 9).

Figure 9: Example of a nonlinear omnichannel purchasing journey



Source: <https://www.bcq.com/publications/2013/marketing-sales-omnichannel-opportunity-retailers.aspx>

The innovations in customer experience management (CEM) range from emerging AI trends in retail operations and robotics for hyper-individualised recommendations to the Store 4.0 as a whole – the smart digital store.

An essential component of the customer journey is the checkout. The convergence from purchase intention to buying behaviour creates the need to enhance the payment process. Customers want easier, faster and more secure payment methods. The financial sector is characterised by constant change and its connection to (e-)commerce has resulted in a wide range of services and (digital and hard) goods. The extension of financial services to digital counterparts, such as cryptocurrencies, mobile payment, and digital payment networks, leads to sales being progressively made via smartphones.

Trading goods has changed substantially throughout the times. From barter trade, to the first attempts at money trading, and the concept of money itself, it has been characterised by change. Currently, consumers use several ways to pay, especially cash, cheques, credit transfer, and credit/debit card transactions (Boel, 2019). As mobile payment progresses, new promises are made to advance the payment process to be even more seamless.

Visa and Accenture are both now working on a payment integration in vehicles. The goal is to enable customers to contactless pay for gas and other products/services while driving.

Instead of just buying in a shop or online, it will be possible to purchase coffee or gas without leaving your seat. This new way of retail is described by the term seamless commerce.

Seamless commerce blurs the lines between offline retail and the e-commerce sphere by establishing a convenient customer journey across all channels (Trendexplorer.com). In fact, seamless commerce is the connection between all sales channels. A seamless customer experience can be achieved via smart devices in offline sales channels or smart technology in online sales channels. Using smart displays in a traditional shop is a method that will become widely adopted in the medium-term. They offer the possibility to present audio-, video-, and text-based information about the brand and its respective products/services in a new and engaging form. To involve customers even more, this information can be shown on the customer's smartphone to initiate participation. Information- and entertainment-seeking (Infotainment) customers are attracted to additional content that this interconnection between online and offline can offer. Links initiated by the smart devices in-store can be associated with a variety of digital platforms, such as the brand's online shop or app – which in turn can maximise churn and retention rates (Jaekel et al, 2019).

Other ways of creating a seamless customer experience include social commerce. E-commerce by social media and social networks is defined as social commerce. It is the capability to purchase products and/or services in an application with the primary focus on either gaming, entertainment, or other social apps.

One of the primary sources for social commerce is the app Instagram (powered by Facebook). Instagram launched its in-app shopping process (buy now button) in March 2019. It allows for an easy checkout processes when buying goods on the platform (Jaffe, 2019). Customers do not have to leave the app to complete their purchase; online shops from different companies are integrated into the platform to perfect the seamless customer experience. The shopping experience is driven by customer metrics and analytics. As part of the Facebook ecosystem, Instagram achieves attraction by (hyper-) personalised advertisements and recommendations. The customer insights attained through large amounts of data points encourage businesses to invest in the platform, especially their purchase features. Instagram was one of the first with this competitive edge (Pardes, 2019).

The traditional, bricks-and-mortar point of sale is also moving towards digital progresses. Technological enhancements make the payment process more convenient. Biometric features enable a more secure pay-out, while the expansion of payment methods facilitates speed and variety. Introducing fingerprints into the payment process as a validation method produces a more innovative approach for retailing. China is one of the key growth drivers here: Alipay is at the forefront, rolling out a facial payment system at a new point of sale machine. Certifying banking accounts might no longer be limited to fingerprints but extended to other body parts. Facial expressions and body poses might complement the fingerprint. The pre-set photo or video of one's facial expression can be linked to bank accounts or digital payment systems, enabling a new approach to payment confirmation (The Guardian, 2019). In combination with the rapid growth of facial recognition software in smart devices (esp. smartphones), facial payment connects the online and offline.

For facial recognition to work, it either takes a two- or three-dimensional image of a person's face and matches it to a database of known images. These images consist of pictures showing people tagged as friends or relatives. In turn, the software uses landmarks, like the nose, mouth, and eyes, as well as the distance between all these features, to identify a specific face and person. After that, the software turns the measurements into a numerical code, which is called a faceprint. This code can be used to find matches (CNET, 2019).

New developments in the facial recognition software use the skin texture as a point of origin for the analysis of facial identification. Measuring the distance between the pores on your face, instead of the distance between your nose, mouth, or eyes, spans the range of facial recognition.

After gauging those distances, the software then turns the measurements into a mathematical code known as a skinprint (CNET, 2019). This process of facial recognition is deemed to be more secure and reliable. The way pores are scattered around the face does not change over time (from adolescence) and cannot actively be changed. Even if the face is partially covered, these advanced technologies are still able to recognise the pores in the part of the face that is not covered (CNET, 2019).

All these technologies and trends are enabled by large amounts of data. Even very intimate data – like the allocation of pores in individual faces – is stored, measured, and interpreted. This raises concerns about data security, ownership, and privacy. Does the information about my pores belong to me or the company that measured them? Consumers and businesses alike demand further clarification on how to apply data regulations. For example, Instagram questions the handling of user data, behaviour and preferences to enable companies to improve their sales.

3.3. Digital Workforce

After tackling possible developments in health and commerce, the next focus point will be the digitisation of the workforce. If you compare current workplaces with the ones in the past, you will spot many changes. Instead of using typewriters, we now have computers and laptops. Instead of travelling to meetings across the country, we use telecommunication tools like Skype or telepresence robots (such as Beam). All the changes improved the efficiency of the workforce and enhanced productivity within companies. There is no end to this development, as new technologies are tested and implemented daily. Their duty is to offload some of the most repetitive tasks to enable capacities to be unleashed in the process.

Especially in the field of human resource management, there are tasks that can be easily delegated to machines or automated software. Activities such as payroll or absence management cause HR managers to lose important working hours. The automation process allows for the release of unused capacities, maximising the potential to concentrate on more complex and creative tasks. AI-based employees like 'Amelia' represent another possible addition to the workforce, guided by the goal of maximising efficiency. Developed by IPsoft, 'Amelia' is designed with the intention to work as an IT service desk operator (IPsoft). More advanced than a mere chatbot, 'she' communicates information and guidance on IT problems using natural language patterns. The embedded deep-learning technology enables the AI to continuously learn and adapt to ever-changing circumstances. By learning through communication with various partners, the objective is to translate human interactions into code, and decode the information to create more engaging experiences. The underlying natural language processing software allows Amelia to understand human intentions and unscramble an unstructured conversation (Marketinsider.de). The advantages of an AI-based employee are vast. Human employees are liberated from performing repetitive tasks and can unleash previously untapped potential. Their capacities would be reserved for tasks that require human decision-making abilities, creative thinking, and complex neuro-systems. By limiting the number of stultifying tasks, employees can focus on challenging duties which can further improve the workplace or promise a greater revenue potential. When looking at the tasks that AI-based assistants are already able to handle; we can expect them to take on even more challenging jobs. At a modern office, there are plenty of tasks that can be automated, such as ordering office supplies, rerouting telephone calls, and organising business trips. There are already software solutions in development and available on the market. Chat robots are nothing new.

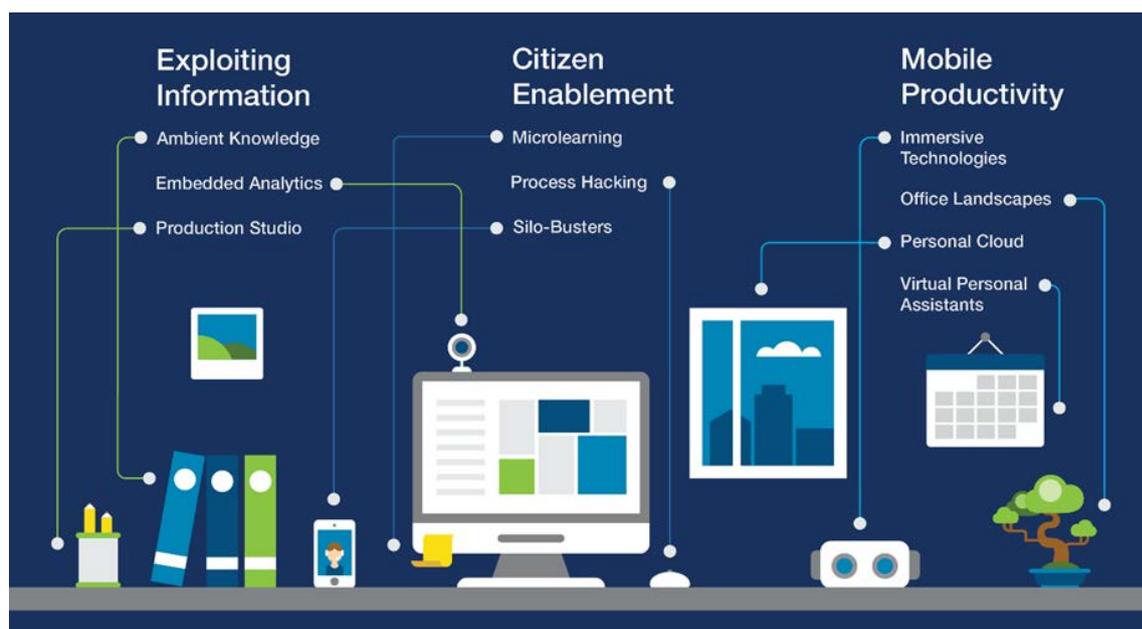
In such cases, it isn't a question of if it is possible to develop such a program, rather it is more a question of market penetration. Improving the current software in order to make it even smarter is essential to its mid- and long-term success.

Another way the workforce is supported in its day-to-day activities is by benefiting from digital assistants. The easiest way to implement this kind of digital assistants is to start off with their diary coordination tool. It scans all the connected diaries to find the perfect time for a meeting between two or more individuals – even when they do not work for the same company. Further applications include digital stenographers that take and transcribe notes during a meeting and are able to send follow-ups afterwards. Even the organisation of meetings is feasible. This is just one of the many use cases for digital assistants, but it represents the mid-term possibilities that the technology might include. While digital assistants seem to be limited to listed tasks, these programs are powerhouses that show the potential to grow into multi-faceted global data networks. The capitalisation from further development and programming work will add more layers of deep learning, turning the digital assistants into digital employees. The technological complementation of the workforce enables more organised and structured work – schedules will be truly synchronised and the number of triggers for feelings such as annoyance (e.g. through repetition) will be reduced.

Furthermore, digital assistants will not remain disembodied voices. They have the potential to mature into fully animated figures (e.g. with a human shape). Digital assistants will gain a personality to create a more emotional experience when interacting with a human employee. They cater to every individual's needs by not only responding to the employee's needs but also by predicting them. A consolidation of several digital assistants advances the opportunities for implementation. They can be coded to assume personalised capabilities and skills. The business 'neon' develops, designs, and distributes AI avatars which look exactly like humans. Not only do they reflect humans in their appearance, but they also reflect their speech patterns and interactions. To make them less intimidating and more natural in their interactions, the neon team is still investing in research and development. In a mid-term perspective, they are destined to take their place in digital offices.

The trusted advisor 'Gartner' assists organisations globally in the analysis of trends and changes. One of their latest findings offers insights into the digital workplace. Figure 10 shows the top 10 trends and technologies that drive the digital workplace.

Figure 10: Technologies Driving the Digital Workplace



Source: <https://www.club-bpm.com/Contenido/Articulos/art-2017-025.htm>

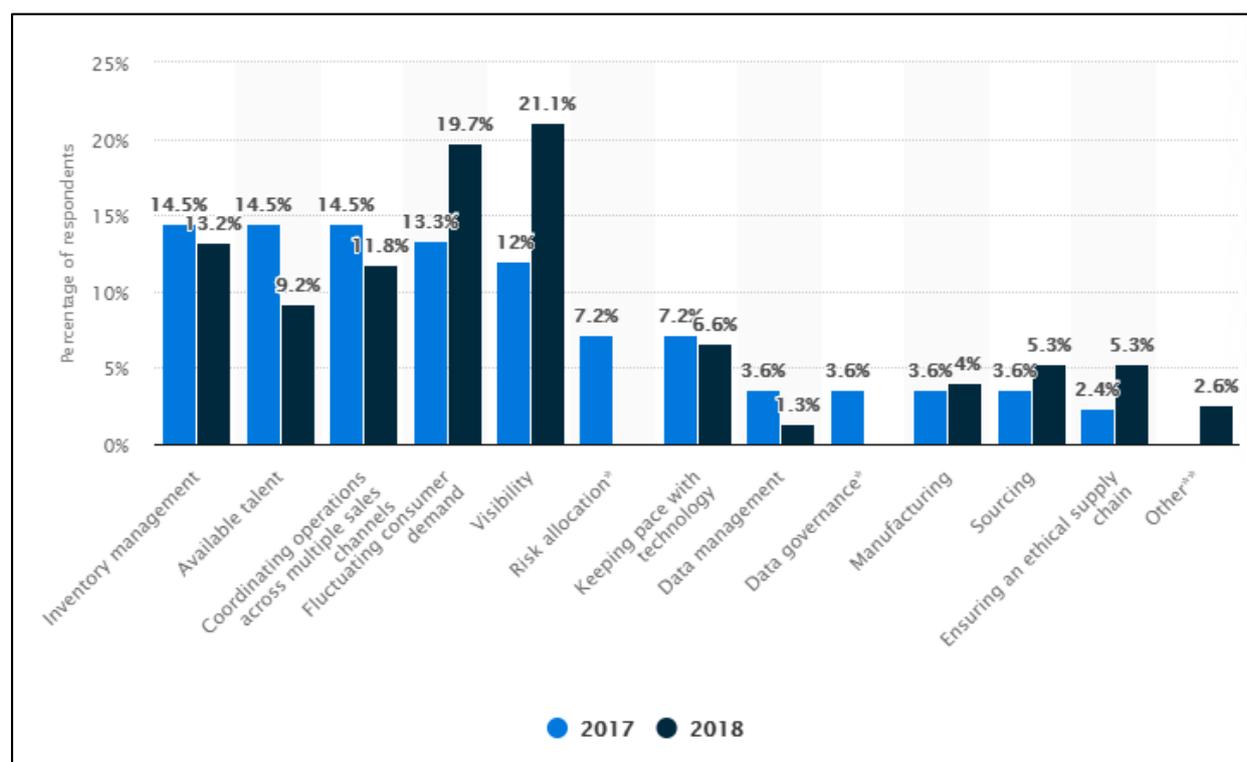
Another advancement is made in the training and onboarding processes that Human Resource teams organise throughout organisations. The US Navy tried out an AI-based tutor to teach technical skills to employees, including an IT system administrator. The navy recruits were trained by the digital tutor and were tested to outperform experts with 7 to 10 years of professional experience. In written exams and real-life situations, they surpassed their more experienced colleagues (National Science and Technology Council, 2016). This example only forecasts the possibilities of AI in the future. With digital assistants teaching technical skills faster and more profoundly than human teachers, education is limitless. The abilities are not limited to technical skills only – they could also teach other hard skills, such as in administration or customer service competence.

3.4. Sustainable Supply Chain

Sustainability is a huge topic, which effects every aspect of our society. So naturally, it also concerns e-tailing (online retail). One major contributor to acting more responsibly towards the environment is the transformation of the traditional supply chain. Instead of producing goods in advance – without being able to accurately estimate the quantity of items required – production is supposed to move towards a demand-driven system.

In 2018, the German Statistical Council (commonly referred to as 'Statista') reported the major challenges that businesses face when analysing their supply chain (see Figure 11). In this survey, supply chain executives from retailers, manufacturers, and brands answered that inventory management and available talent are considered crucial when managing supply chains globally. The coordination of operations across multiple sales channels is also considered a key challenge in the global network. This assessment underlies businesses questioning traditional supply chain methods.

Figure 11: Biggest challenges facing the supply chain



Source: <https://www.statista.com/statistics/829634/biggest-challenges-supply-chain/>

The solution to this problem may lie in a familiar product: 3D printers. First invented in 1981, the technology has been around for almost 40 years (Autodesk). Initially developed just for prototyping purposes, we can now see a progression towards printing finished goods as a whole – even a house is possible in less than a day (all3dp.com).

The implication for the current supply chain is serious. A development away from pre-planned production (at facilities in low-cost countries) towards decentralised production (in local markets) puts customers at the centre of the operation (mainpointe.com). 3D printers are mostly portable by design and easy to set up, allowing for quick implementation almost anywhere. Instead of producing just-in-time and trying to optimise storage solutions, 3D printing makes it possible to print necessary parts or even the whole product whenever required. The importance of a safety stock is reduced, diminishing the need to manufacture assembly parts worldwide. The idea of local production is growing. To lower the logistical need to transport finished goods, the last mile is being scaled down to the transport of raw materials (Supplychaindive.com). In the mid-term perspective, the supply chain might depreciate to the point of redundancy for complex global supply chains that are based on the notion of transport and assembly.

Even the design of goods and their various assembly parts is undergoing a transformation. ‘Airbus’ serves as an example for an organisation that fosters innovation in its design processes. Their airplanes now feature 3D-printed parts. The overall goal is to reduce the weight of airplanes, causing them to emit less carbon dioxide during their lifecycle. Producing a component with a 3D printer reduces its weight by 55%. This also reduces the amount of raw materials by up to 90% (Airbus.com).

Production itself is targeting the abandonment of environmentally harmful materials. Plastic is a major contributor to global pollution, making it an interesting material for elimination from the production process.

On the other hand, environmentally sustainable materials are in demand and are being tested for implementation. Belying the general misconception that 3D printing is limited to environmentally harmful materials, the technology is able to work with natural materials too. New filaments containing alternatives such as bamboo- or hemp-fibre are being improved in strength and robustness to gradually replace traditional filaments. We now print small decorative figurines and prototypes, but by the year 2025 this is estimated to grow into a commonly used technology that will enable the production of furniture with sustainable filaments.

3D printing has proven to be a valuable source for triggering innovative design thinking. It demonstrates profitability (from the first production unit) and scales down the waste and consumed energy. In order to be able to produce with 3D printing technology, the amount of time, money, and know-how is limited. The design of most printers is quite intuitive.

3.5. Conclusion

The ongoing digitisation is influencing various spheres of institutions, organisations, businesses, and consumers alike. According to this analysis, the digitisation process is estimated to be completed by the year 2025.

The implementation of a digitised hyper-individualised health care system, the transformation from a traditional to a digital workforce, the inseparability of offline and online commerce, and the increasing importance of sustainability throughout the supply chain will all transform the digitisation into an omnipresent construct.

4. LONG-TERM PREDICTIONS

KEY FINDINGS

In the long term, there will be a balanced and inclusive economy. Fully digitised and customisable services and solutions will allow consumers to create products that perfectly fit their needs.

Technologies will enter the next generation with new scientific findings to increase their efficiency and sustainability. Everything that we know now will be more customised to fit each individual's needs. Current issues, such as the climate crisis, will be dealt with to create a liveable future for the next generations.

Long-term predictions are made the year 2030. The predictions made are a possible development based on the current situation in science, economy and politics. These innovations will tackle the issues that today's society is dealing with to create a safer, more efficient and liveable future. Four innovative technologies can be highlighted.

Firstly, the 6G internet. Even though 5G has not reached the general public yet, the cellular system of the sixth generation is already being researched. The new mobile services will be able to process the steadily growing amount of data and provide high-speed data flow.

Long-term predictions are made the year 2030. The predictions made are a possible development based on the current situation in science, economy and politics. These innovations will tackle the issues that today's society is dealing with to create a safer, more efficient and liveable future. Four innovative technologies can be highlighted.

Firstly, the 6G internet. Even though 5G has not reached the general public yet, the cellular system of the sixth generation is already being researched. The new mobile services will be able to process the steadily growing amount of data and provide high-speed data flow.

Autonomous driving will find its place in our daily lives and economy. The advantages, like increased safety and efficiency, will significantly influence our traffic in cities and communities, as well as logistics. New solutions, apart from regular cars and vehicles, can also extend into the air space. In this way, personalised, fast and secure transportation and logistics will be made possible.

Increased scientific knowledge will lead to more personalised services. Customisation based on personal preferences or even genetic characteristics will provide the highest possible satisfaction for each individual customer or user. Hyper-individualised services and goods will reach into every aspect of our lives – from food, to living spaces, to healthcare, retail and digital services.

The final prediction deals with one of the most pressing social and economic issues of our times: the climate change. The negative impact of the economy on the worldwide climate will be stopped by using sustainable, non-harming and environmentally-friendly solutions. In addition to stopping pollution, the economy will find ways of eradicating the damage already caused in the past. In this way, a future worth living will be provided to future generations.

4.1. 6G

While the network providers are urgently working on building infrastructures for 5G and selling them to their customers, several parties have started their research on the next generation of mobile data transfer: 6G (Eilhard, 2020).

Depending on the research team and sources, 6G could be somewhere between 10 and 8,000 times faster than 5G. According to Chinese researchers, this would mean that 6G could transmit 1 terabyte in just one second.

These new speeds of data transmission could facilitate new dimensions of data transmission, with the connection of services or devices to the brain being of particular interest. It could then be possible to manage those through the brain by transmitting the large amount of data stream from our brains to other recipients. What would be possible with that kind of technology is rather varied and could lead to the total connection of humans to their devices (Hindustan Times, 2020).

Issues raised at this point of the research involve existing technologies, such as chip design, computer architecture and the use of energy. These issues must be settled in order to ensure a safe and environmentally-friendly 6G. The amount of data transmitted requires a great deal of energy which will lead to extreme temperatures. Computer chips these days could not cope with the amount of data. What's more, high-performance chips are cost- and resource-intensive (Hindustan Times, 2020).

The new network will fit the needs of the growing masses of data. Data traffic is rising due to streaming and the high usage of online services in general. Connecting all your devices will be easier and faster through improved wireless connections (Eilhard, 2020). Online streaming will improve access to information and content, for commercial, government and personal use. Therefore, e-commerce can improve their supply with the use of consumer data on personal health, diets, preferences and other information to personalise services and products. E-government can offer ubiquitous services, such as business development, online tax and legal support, employment services or online education. Overall, the increased speed and capacity of streaming through 6G can broaden the access to European diversity, providing intelligence, scientific research and knowledge of different European institutions, companies and citizens in an efficient and affordable manner (Maciejewski et al., Streaming and online access to content and services, 2014).

6G in industries

Industries will greatly benefit from accelerated data transfers. Especially in production plants and factories, the devices will be fully connected through 6G. Already today, companies are switching to wireless connections between single units of their productions.

The Internet of Things – the total connection of devices and services of any kind – will be extremely fast and efficient through 6G technologies. Businesses, civilians and whole societies will profit from this. Important data will be available at any time and from anywhere.

Autonomous transportation requires an instant connection between different vehicles. Through 6G, the communication between road users will be seamless, safer and faster.

To sum it up, 6G is not simply about fast connections for cell phones. Everything we know today that is connected to the internet will be enhanced for our demands.

6G research

Research is focused on expanding the bandwidth and increasing the speed of data transmission. Several countries are creating teams to research the topic and develop the basis of 6G. Top of the list is China.

The country set up a team of 37 researchers, experts and specialists from universities and technology companies. The project is supported by executives from ministries. Japan is planning to set up a government-civilian research society under the chairmanship of the University of Tokyo Goshinjin, with supervision from General Affairs Minister Takao Sanae. (Hindustan Times, 2020).

6G research in the EU

In Europe, there are also teams working on 6G. The Fraunhofer Institute is researching ways of fusing mobile data and Wi-Fi, so that we will have a seamless connection at home, work or in public spaces. The Vodafone chair at the University of Dresden and the University of Wuppertal have also teamed up experts to explore the possibilities of 6G and lay the groundwork for the next generation of networks.

In Finland, the University of Oulu received €250 million of funding for the flagship project 6Genesis. All research teams aim to test their first 6G networks by 2030. (Dahad, 2019).

4.2. Autonomous Transportation

Autonomous transportation aims to make travelling and logistics safer, more efficient and more sustainable. The technology has great potential for different aspects of daily life and the economy.

To ensure the safety of all participants in road and everyday traffic, the European Parliament has agreed on a proposal, that includes regulations for motor-vehicles: tyre pressure measuring systems must be included, as well as a intelligent speed assistant, advanced distraction recognition and an emergency stop signal. All passenger cars and light commercial vehicles must have advanced emergency brake systems, lane keeping assistants, accident data recorders and the head must be enlarged in order to provide more safety in case of a collision with pedestrians or cyclists. Buses or trucks will have to be equipped with the following: An emergency brake system, a lane departure warning system and a warning system to inform about pedestrians and cyclist being too close to the vehicle. Also, the visibility of other road users must be enhanced through an improved design. These measures must be taken in order to ensure safety for autonomously driving vehicles. (Dobrita A. et al. Workshop on "Type-approval requirements for motor vehicles as regards their general safety and protection of vehicle occupants and vulnerable road users", 2019)

Autonomous people transportation

Firstly, self-driving cars will relieve the traffic situation, especially in metropolises, cities and urban areas. In addition, they will pollute the air less through efficient and sustainable driving. Ridesharing with autonomous cars, buses and taxis will make owning and driving a car unnecessary.

Companies are promising to make their cars safer through self-driving technologies. They can prevent car crashes and accidents with pedestrians or cyclists. (futureagenda.org, 2020). Human-driven cars are estimated to decrease by 30%, once self-driving reaches the streets.

Autonomous travelling will give people more time for other things than steering a car. This extra time can be used for both work and entertainment. Companies like Audi are creating entertainment systems with VR goggles for use while travelling by car. A whole new market could emerge from this. (Audi, 2019).

Apart from streets and airspace, autonomous driving will reach rivers and oceans, too. Rolls Royce has started research on autonomous ferries and tested its first self-driving ship in Finland in 2019. (Forbes, 2019).

Autonomous delivery

Besides people transportation, logistics will strongly benefit from self-driving technologies. Self-driving robots can deliver goods in real-time to the customer's doorstep (see Figure 12). Delivery will then be fully personalised to fit individual needs.

Besides fully automated robots, drones will deliver goods just as individually and quickly as robots on the ground. This direct and on-demand delivery will relieve the traffic from bigger delivery trucks and decrease direct pollution. Cities will thereby be cleaner and less congested. (FedEx, 2019).

Figure 12: FedEx Autonomous Delivery Robot



Source: <https://about.van.fedex.com/newsroom/thefuturefedex/>

Autonomous logistics

On a bigger scale, long-distance delivery and logistics can also be fully automated through autonomous driving.

Trucks can make use of platooning, a technique whereby multiple trucks drive in columns and communicate via an internet connection. This has two different advantages. Firstly, safety on motorways is increased, since there will be no dangerous manoeuvres to overtake other trucks. Secondly, by driving in the slipstream of the trucks ahead, trucks will travel more efficiently (see Figure 13). (German Association of the Automotive Industry, 2020).

Figure 13: How platooning works



Source: <https://www.vda.de/de/themen/innovation-und-technik/automatisiertes-fahren/platooning.html>

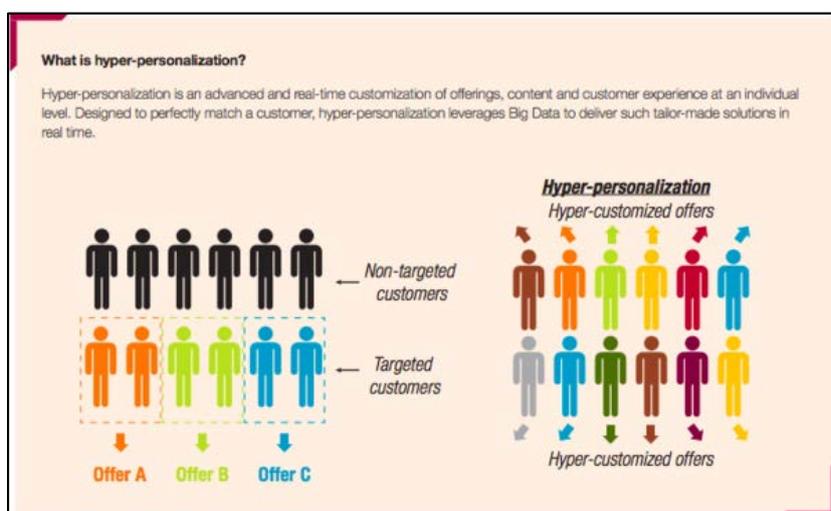
Container ships and harbours will be fully automated in the future. The Norwegian company Yara International ASA has announced plans to develop the world's first autonomous and zero-emissions container ship. In this way, they aim to cut diesel-powered truck haulage by 40,000 journeys per year. (Yara, 2018). Moreover, machines and vehicles used in harbours will be unmanned in the future. The emissions will be dramatically decreased and work will be highly efficient.

In the future, it will be possible to have unmanned, safer and more efficient transportation and logistics through autonomous driving. Transport can be fully personalised for users and companies.

4.3. DNA-based Personalisation

With advanced technological and scientific knowledge come a variety of possibilities. DNA testing and personalisation enable more engaged experiences beyond what traditional methods can do. Curiosity for DNA-based products has increased throughout many sectors and has led to the development of various types of hyper-individualised products (see Figure 14). (Capgemini, 2016). Besides DNA tests, technologies, products and services will be hyper-individualised in future. Advanced data analytics and artificial intelligence are helping companies to provide individual services to end consumers (wallstreet-online.com). These aspects are important for hyper-individualisation: data collection, customer segmentation, targeted communication and measuring and analysing the efforts made. (medium.com, 2019).

Figure 14: What is hyper-individualisation?



Source: https://www.capgemini.com/consulting-fr/wp-content/uploads/sites/31/2017/08/hyperpersonnalisation_vs_segmentation_english_05-01-2017.pdf

Personalised services

HSBC is planning on hyper-personalising its online banking for customers. They have realised that through new technologies, the behaviour of customers and their relationship to money and banking will change in the following years. They are working together with fintech and cyber security companies, and predict a consumer behaviour revolution. Customers may create their own digital IDs, taking more ownership for their actions.

Technologies like voice activation and augmented reality will be applied in future banking concepts. In this way, consulting a bank employee or advisor in more complex situations will be possible. Already today, HSBC is using service robots to simplify customer interactions (see Figure 15). (HSBC, 2019).

Figure 15: Service robot for banking

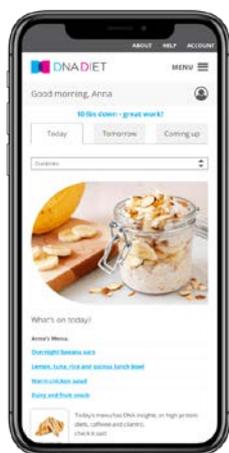


Source: <https://www.roboticsresearch.ch/>

DNA-based nutrition

Companies like DNA Diet are using genetic information to create individually suitable diet plans for people. It looks at over 100 different aspects of DNA to abstract the most important information and then provide suggestions on what foods to eat and which to avoid (see Figure 16). In addition to food suggestions, it gives insights into what physical activities suit a person best. (DNA Diet, 2020). While this is already possible today, it is still a niche for people who can afford DNA tests and these specific products. In the upcoming years, it will be more affordable and accessible for the wider public to make their nutrition fit their personal needs.

Figure 16: Interface of DNA-based nutrition service



Source: <https://www.dnadietplan.com/us/>

4.4. Climate Positive Economy

What is “Climate Positive”?

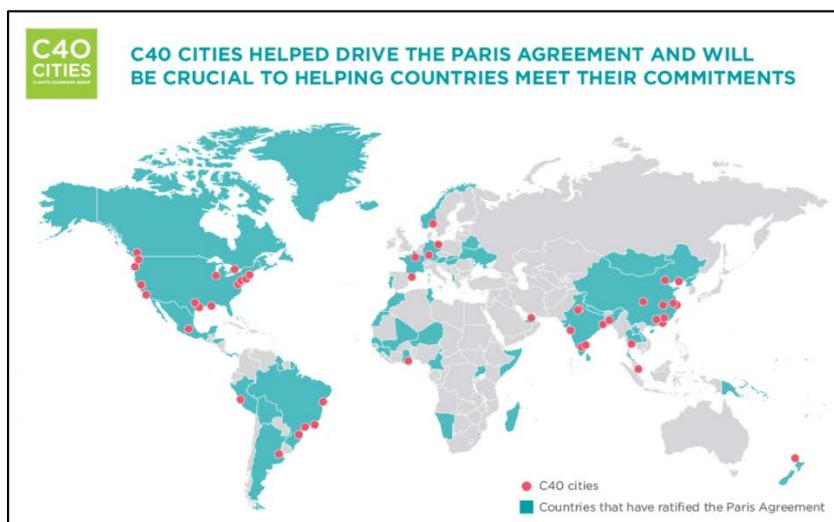
“Climate Positive” projects target a net-negative operational greenhouse gas emission associated with energy, waste and transportation. This outcome is achieved by reducing emissions on-site and offsetting emissions by reducing carbon.

The ways to achieve climate positivity include energy-efficient buildings, low carbon transportation solutions, and waste and water management systems. (c40.org, 2020).

Climate positive cities

A strong focus is on cities, since they produce large amounts of emissions through traffic, factories and a high use of energy. C40 cities aim to be climate positive through different concepts. These concepts focus on areas like energy and buildings, transportation and urban planning, food, waste and water, air quality and adaptation implementation. Nineteen countries in Europe have committed to having a C40 city and being climate positive (see Figure 19). The economy in cities is an important factor when it comes to emissions production and will be reduced in the future through more intelligent and sustainable production or measurements to compensate the greenhouse gases. (c40.org, 2020).

Figure 19: Overview of C40 cities



Source: <https://data4good.com.au/tag/glik/>

Climate positive companies

Many companies are making strong commitments to be climate positive. Henkel, for example, committed to reducing its carbon footprint by 75% by 2030. This will be achieved through improving energy efficiency and drawing 100% of energy from renewable resources. (Henkel, 2019).

Ikea has also committed to becoming climate positive by 2030. The Inter Ikea Group has announced plans to invest €200 million in making the company climate positive.

The ambitions are varied and range from the production and supply chain to the stores and products used at home.

The way products are produced will fundamentally change in the future. 36.4% of Ikea's carbon footprint comes from the materials alone. Ikea will soon be sourcing wood and other materials from certified and sustainable sources only. (fastcompany.com, 2020).

The circular economy is also highly important. The economy will move away from throwaway products towards recycling, upcycling and creating higher quality goods.

Thanks to new technologies, supply chains will become more sustainable, energy will be clean and efficient, and products will become less harmful to the environment. (fastcompany.com, 2020).

The impact of the climate crisis on the economy

The economic system will listen to critics of capitalism and integrate their demands and needs into new structures. New products will emerge from current issues and new technological advances. Overall, it will lead us to a more inclusive and balanced economy.

4.5. Conclusion

In conclusion, one can make following predictions for 2030: services and products will be fully customisable. They will fit individual needs and preferences. This applies to every aspect of life – from goods to digital services to transportation. New scientific findings show that technologies will enter into the next generations. Processes will be more efficient, for civilians as well as for businesses, companies and governments. Sustainability is a main focus and will be achieved through new developments. This is how current social issues, such as the climate crisis, will be dealt with.

5. RECOMMENDATION FOR ACTION

This report has demonstrated how dynamic the foreseeable future will be and what concrete trends can be predicted. The upcoming digital services will be deeply rooted in all walks of life of every European citizen. They will be data- and AI-driven. Digital services will be the foundation for many parts of the average everyday life of people in the countries of all member states of the EU.

Thus, it must be the ambitious goal of the Digital Services Act to lay the groundwork to promote the digital leadership of Europe in order to be in control of unfolding developments. Three concrete action plans to make digital leadership a reality should be considered.

5.1. European Cloud / European Internet

The EU should include an action plan for a digital cloud – a European Internet – in the DSA. This European Cloud would foster a European digital ecosystem based on data and innovation. It would drive competition and set standards. Foreign web services could become part of such a digital ecosystem but must adhere to the rules and standards of the EU – such as democratic values, data protection, data accessibility, transparency and user friendliness.

Technologically, it would require a top-level infrastructure, high-speed 5G or a 6G data network and a firewall. Setting up such a network would promote many European companies and therefore boost business and drive innovation.

Like the Chinese firewall, this European internet would block off services that condone or support unlawful conduct from third party countries.

5.2. Venture and Funding Programme for eGovernment

Start-ups and entrepreneurs are at the heart of all future developments in digital services. Without the passion, drive and dedication of business owners, hardly any progress will be made.

The administrative apparatus of the EU and all governments in the member states should be a beacon for digitisation. To lead by example, the EU should commit to setting up a venture and funding programme for eGovernment, enabling start-ups and technologies to build a completely new form of legislative process and citizen participation. The aim is to become the most modern government in the world – using and integrating the technologies and digital services that they govern. This would mean that all government buildings in Europe should become the testing ground for smart home and office technologies. MEPs should become the innovation early adopters – as digital literacy should be high.

This venture and funding programme should be created alongside the already suggested Digital Europe Programme with a proposed €9.2 billion of funding for 2021-2027, promoting a variety of technology start-ups.

The programme should build on the EU eGovernment Action Plan for 2016-2020, which included solutions for labour mobility, recognition of qualifications and others. It also strived to unify eGovernment solutions across countries, as many EU countries do have eGovernment that do not function across borders. (Godel et al. 2016). While some EU Member States are already a bit further ahead with eGovernment solutions, an EU wide framework is needed. Initiatives are often delayed or postponed, and hardly include major legislative proposals. (Atkinson et al. 2015). Including and incentivising the private sector, especially innovative start-ups, could speed up the development of eGovernment systems in the EU.

5.3. Visionary Communication Programme

As new technologies, trends and digital services will keep appearing in the next years, it is paramount for legislation and agenda setting to be constantly reviewed and updated.

In this report, we have not mentioned the impact of crypto-technologies or quantum computing, for example, because this impact is not foreseeable. As soon as applications based on these technologies are distributed in digital services, they will have enormous implications for all digital service sectors and would be mentioned in a report like this. As this type of report needs regular updates, it might be necessary to update the legislation and framework of the Digital Services Act on a regular basis too. If the EU wants to be a leader in all aspects of digital services, it is crucial to communicate the EU's digital strategy to European citizens on a regular basis.

This is the reason for a Visionary Communication Programme. In this programme, the EU needs to regularly communicate the next developments in digital advances and their impacts on legislation and life in Europe. The Visionary Communication Programme will be designed as a communication strategy of the European Commission and Parliament to aim to explain the current developments in digital services to European citizens. Similar to the Chinese government's five-year plan, the Visionary Communication Programme will set the agenda and frame a strategy to manifest digital goals in the minds of European entrepreneurs, decision makers and the general public, operating as a self-fulfilling prophecy.

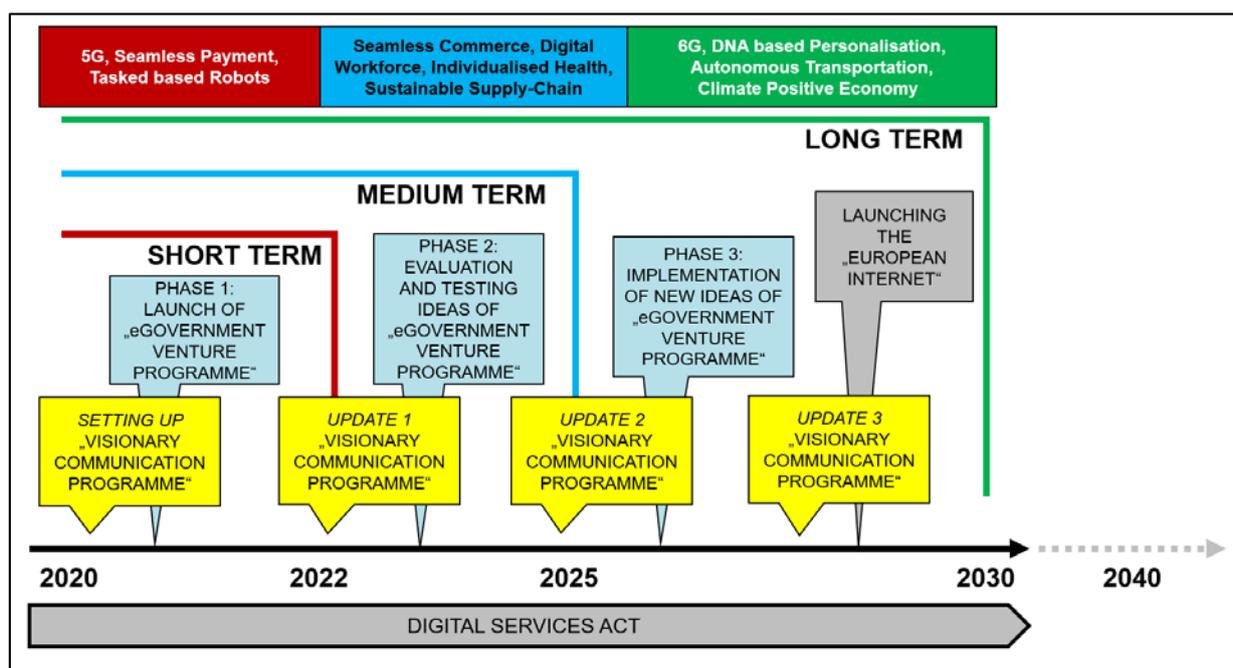
Thus, all member states should commit themselves to communicating and developing visionary digital services within their communities and countries. The EU should take the lead and communicate its approach to new technological developments – how it will build a legal framework and how it will fund companies in a certain sector of those developments. The aim is to inform, educate, inspire and be the lead.

5.4. Action Plan Timeline – Act Now

Focusing on becoming a leading digital continent the EU should set a tight schedule for implementing the recommended action plan (see Figure 20). The current timing in 2020 for taking action to foster digital services in Europe is very benign for policy makers. Despite all the negative effects on the health system and the large parts of the economy the corona crisis has worked as a positive image campaign for the entire digital services industry.

As e-commerce and remote working solutions became widely used and even smartphone tracking to prevent infections met very little scepticism. Now in the aftermath of this pandemic it's the perfect time to act and to push for ambitious goal in digitalising Europe.

Figure 20: Action plan timeline



Source: Own illustration

Short term 2020 – 2022

Setting up a Visionary Communication Programme: task-based robots, 5G, seamless (facial) payment. Starting the communication of the digital agenda within Europe.

Update 1 of the Visionary Communication Programme in 2022. What are the digital trends and topics that Europe should pursue, or that will have an impact on European life? – i.e. individual health, robots in the health sector, sustainable supply chain.

Phase 1: Launch of the eGovernment Venture Programme.

Getting start-ups to sign onto the programme to start developing innovations for the governments within Europe (i.e. possible topics for Phase 1: digital election, smart office applications for all government buildings, cybersecurity for all MEP).

Medium term 2022 – 2025

Update 2 of the Visionary Communication Programme: i.e. crypto, quantum computing. Here it is important to include visionaries, think tanks and influences to communicate the update to the public.

Phase 2 of the eGovernment Venture Programme: Testing and evaluating first technologies and ideas developed in the programme.

Initialising the European internet: setting up think tanks to creating the cornerstones and possible pitfalls of such a project.

Initialising the European internet: setting up think tanks to creating the cornerstones and possible pitfalls of such a project.

The Digital Services Act (DSA) is the foundation of such an action plan timeline.

Initialising the European internet: setting up think tanks to creating the cornerstones and possible pitfalls of such a project.

Long term 2025 – 2030

Update 3 of the Visionary Communication Programme: i.e. 6G, European internet, DNA products. Further communication within the Europe of the new digital goals.

Phase 3 of the eGovernment Venture Programme: Implementation of innovations developed in the programme. Officially Launching the European Internet: Similar to the Chinese Firewall.

The Digital Services Act (DSA) is the foundation of such an action plan timeline.

Initialising the European internet: setting up think tanks to creating the cornerstones and possible pitfalls of such a project.

6. CONCLUSION

This report assists the legislative decision-making process regarding the Digital Services Act. Its purpose is to widen the imagination and inspire lawmakers to take bold and visionary decisions. The aim is to lay the legal foundations for Europe to become a digital leader.

The digital business world will pick up speed in the next few years and it is essential for Europe to gain momentum in developing a sophisticated and advanced digital ecosystem. As laid out in chapter 2, the digitisation of all industries is expected to happen in the near future.

The authors of this report have shown that digital development will impact the lives of European citizens in the next few years. Most examples were taken from other areas of the world, rather than Europe. In fact, Europe is 3-5 years behind the US and China on new technologies and digital services (see chapter 3). Therefore, the authors of this report have been able to make such predictions.

In chapter 4, predictions for the year 2030 and beyond were made. They are based on the presumption that the digitisation of almost all modern societies has taken place and take a look at the bigger picture. Major trends such as hyper-individualisation and sustainability in digital services are explored in detail and predictions are made.

Concluding the trend analysis in digital services, three underlying trends at the heart of all upcoming digital services were identified. These form the basis of most innovative services in the future. They are:

- Seamlessness
- Hyper-individualisation
- Sustainability

Finally, the authors present recommendations in the form of three action plans. They are a crucial element of this report and aim to create the framework for a digital Europe that does not fall behind other economic regions and is self-sustainable. They are directed at the MEPs and their aims are to initiate and implement a bold framework for the future.

Let's build a new digital Europe!

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The study lays out predictions for digital services in the next one to ten years and provides recommendations for action for the European Parliament in preparation for the Digital Services Act.

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